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CHEMICAL & ENGINEERING NEWS

C&EN

JULY 25, 1994

HOECHST TOPS RANKING OF WORLD'S 50 LARGEST CHEMICAL PRODUCERS PAGE 17

PACIFIC RIM

Opportunities grow for investment by U.S. chemical firms

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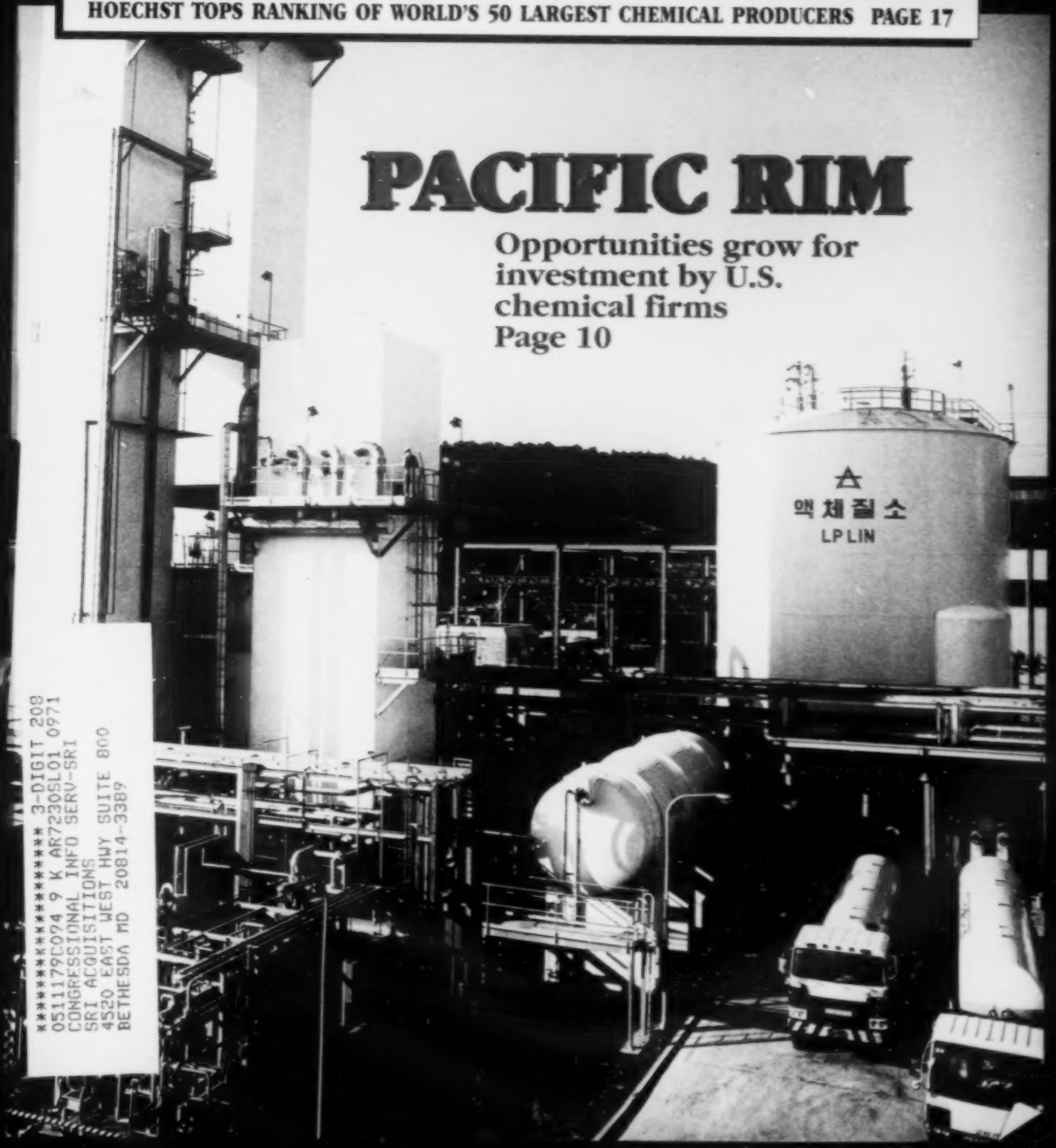

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CHEMICAL & ENGINEERING NEWS

C&EN

JULY 25, 1994

NEWS OF THE WEEK

■ Comet Shoemaker-Levy 9's dazzling impact on Jupiter generates wealth of information, including surprising spectroscopic detection of diatomic sulfur (S_2) in Jovian atmosphere. **Page 6**

■ Researchers use laser-excited xenon in a technique that opens up potential for in vivo magnetic resonance imaging of lung, brain, and other human organs. **Page 7**

■ Union Carbide and Petrochemical Industries Corp. of Kuwait award contract to Fluor Daniel for engineering, procurement, and construction of a $1 billion petrochemical complex in Kuwait. **Page 8**

■ Synergen faces uncertain future, price of stock plunges as company halts development of its flagship product, the antisepsis drug Antril, after disappointing clinical trials. **Page 8**

■ At celebrations marking the 25th anniversary of the Moon landing, Administration reiterates commitment to space program, innovation, and pursuit of knowledge. **Page 8**

■ EPA shifts approach to environmental regulation; through the Common Sense Initiative, focus will be on overall impact of entire industries rather than on individual pollutants. **Page 9**

COVER: Air Products & Chemicals jointly owns industrial gases complex in Onsan, South Korea, with partner Korea Industrial Gases

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BUSINESS

Hoechst ranks first among world's 50 largest chemical producers for 1993, a year in which the industry posted lower sales as it struggled against low prices and currency fluctuations. **Page 17**

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Controversial changes in NIH's grant approval process are being considered, and some are being tested, as the agency eyes goal of doing more with its resources. **Page 20**

More regulation of dioxin emissions is needed, say two activist groups that cite biological effects from ingestion of minute quantities of chemicals. **Page 21**

SCIENCE/TECHNOLOGY

The outcome of a recent commercial catalyst and process industry conference may help chart a course for revitalization of industrial catalysis research and development. **Page 25**

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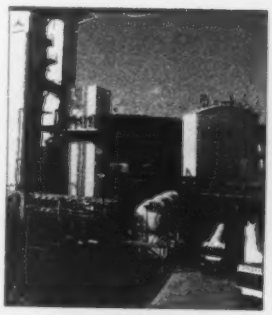
MEETINGS

ACS Industrial & Engineering Chemistry Division's Symposium on Emerging Technologies in Hazardous Waste Management features over 650 papers, various workshops. **Page 43**

Polymer Chemistry Division's 17th Biennial Symposium on Polymers in Critical Technologies will be held in November in San Juan, Puerto Rico. **Page 52**

NEWS FOCUS



U.S. chemical companies boost investments in fast-growing Pacific Rim region, despite infrastructure problems and economic and political uncertainties in some countries. **Page 10**

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LETTERS

Ethics, responsibility in science

Both your editorial "Responsible Science" (C&EN, June 27, page 3) and the news article on page 7 offer self-congratulations on the uncovering of fraud in a report of the enhancement of enantioselectivity by a magnetic field. The matter is described as "an example of good science" that purified itself in only four months.

Not only was much time and effort wasted by others attempting to replicate the reported results, this time the fraud cannot be dismissed as being in medical science. Since it was in physical science, it reflects on all of us, and on how the public perceives the way our science works and how we behave.

Extraordinary claims demand extraordinary evidence, and evidence that can be manipulated by a single graduate student is not extraordinary. A large share of the responsibility rests on the professor in charge, who should have supervised and demanded iron-clad evidence. We have already learned from the polywater, cold fusion, and immunological dilution episodes that editors of some scientific journals are more interested in publicity than reliability.

R. Bruce Martin
University of Virginia
Charlottesville

Your report concerning the unfortunate claim that enantioselective reactions had been achieved in a static magnetic field [Guido Zadel, et al., *Angew. Chemie*, **33,** 454 (1994)] brings forth the following question: What was the reasoning behind the experiment to begin with?

Studies by Pierre G. de Gennes [(*C. R. Hebd. Seances, Acad. Sci. Ser. B*, **270,** 891 (1970)]; C. Alden Mead, et al. [*Tetrahedron Lett.*, 1063 (1977)]; and Mead and Albert Moscowitz (*J. Am. Chem. Soc.*, **102,** 7301 (1980)] have provided theoretical reasons why the experiment should not produce the desired result. To quote Mead and Moscowitz: "We recently showed ... that asymmetric synthesis at thermal equilibrium cannot be brought about by any combination of uniform, static electric, and magnetic fields." Moreover, in this same paper, they concluded that earlier claims by Ralph C. Dougherty [*J. Am. Chem. Soc.*, **102,** 380 (1980)] and Dougherty, et al. [*J. Am. Chem. Soc.*, **102,** 380 (1980)] of having achieved asymmetric synthesis from achiral reagents in a rotating vessel "is entirely without any foundation and cannot be taken seriously as an explanation for the data reported."

Finally, concerning the work of Pierre Curie on symmetry and asymmetry quoted by Zadel, et al., there is a charming description by his wife, Marie, in her biography of Pierre "Pierre Curie," Macmillan Co., New York, 1923, page 55), which indicates he was aware of the negative results to be expected by experiments of that sort.

To quote her own quote of his conclusions reached between 1893 and 1895: "When certain causes produce certain effects, the elements of symmetry in the causes ought to appear in the effects produced. When certain effects reveal a certain dissymmetry, this dissymmetry should be apparent in the causes which have given them birth. The converse of these two statements does not hold, at least practically; that is to say, the effects produced can be more symmetrical than their causes."

The papers cited in my second paragraph demonstrated, nearly two decades ago, that the application of such fields should have no effect on the outcome, as was clearly envisioned by Pierre Curie exactly 100 years ago.

Ivan Bernal
University of Houston

Scientific integrity is in the limelight again. First, at the risk of being accused of ignoring an individual's right to due process, three cheers for the German scientific community's quick action in resolving the matter of publishing fraudulent research results without going through protracted legal wrangling. At the same time, I was somewhat concerned by the article on a conference attended by more than 200 people in Washington, D.C., to

Correction

- May 16, page 25: Installation cost for a Buss loop reactor for medium-scale hydrogenations would amount to $200,000 to $250,000, not the $750,000 implied. This cost would include positioning on foundations; piping, control, and electrical connections; and commissioning.

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Global Top 50 Chemical Producers Troubled By Low Prices, Slow Economies

■ ***Hoechst edges out BASF for top rank, Bayer garners fourth for strong German showing; overall, sales are down***

Patricia L. Layman, C&EN London

If 1992 was a bleak year for the international chemical industry, 1993 was not the restorative tonic the industry had hoped for. Chemical sales for the 50 largest international chemical producers were down 9% to $306 billion, and profitability continued to decline. However, the rate of that decline has begun to slow: the average chemical operating profit margin in 1993 was 7.2%, compared with 7.3% in 1992 (C&EN, July 26, 1993, page 29) and 7.5% in 1991. The average operating profit margin for 1990 was 9.9%, as the industry began slipping from the frothy heights of the late 1980s. The comparable average for 1989, the year C&EN began ranking the global Top 50 companies, was 14.4%.

Moreover, last year's results reflected the effect of exchange-rate fluctuations on the industry even more than in 1992. For example, 11 Japanese companies rank among the Top 50 for 1993, one more than for 1992, and chemical sales of the top companies in Japan's chemical industry were up 15% from the year before. Most of that increase was attributable to the strong yen, for which the average exchange value relative to the dollar appreciated 14% in 1993 over 1992.

On the other hand, in recession-plagued Europe, currencies fell against the dollar—dropping from 6% in Germany and the Netherlands to 18% in the U.K. and 28% in Italy. Sales of the top European chemical companies totaled $168 billion in 1993, a decrease of 18% from a year earlier. These sales came from 24 companies, one less than the year before, and accounted for 55% of the global total, down from 61% in 1992. Nonetheless, three of the top four companies were German: Hoechst, which took first place this year, BASF, now number two, and Bayer, fourth. The U.S.'s DuPont took third place.

U.S. companies among the global Top 50 numbered 15, the same as last year. However, sales for the 15 as a percentage of the global total increased slightly, to 27% from 25%. Sales reached the same percentage level as in 1991, another year when the dollar was relatively strong.

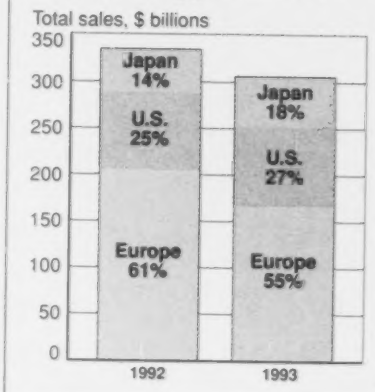
Currency fluctuations were not the only factor in the overall drop in sales. Prices and volume of sales also played major roles, points out Alasdair Nisbet, chemicals analyst with London-based stock analysts UBS Ltd., as did divestitures of small, noncore corporate businesses. Sales for most companies were down, he says, in large part because of low product prices. That was particularly true for petrochemical and polymer producers—prices for products such as polyethylene, polyvinyl chloride, and polypropylene have been at "summer-sale" levels throughout the past year. And with the rising price of feedstocks, raw material costs are further squeezing petrochemical producers.

Only the yen increased against the dollar in '93

Currency	Change versus U.S. dollar 1992–93[a]
Japanese yen	+14%
Belgian franc	–8
British pound	–18
Dutch guilder	–6
French franc	–7
German mark	–6
Italian lira	–28
Norwegian crown	–14
Swiss franc	–5

[a] Average exchange rates each year.

Europe's share of global Top 50 dropped in 1993



As would be expected among the Top 50, there were shifts in the rankings; some 45 of the 50 companies changed places. Following British chemical giant ICI's midyear spin-off of its bioscience operations into a new company called Zeneca, ICI fell to fifth place from third, based on the pro forma results it reported for the full year. Two companies—Teijin of Japan and AlliedSignal of the U.S.—were added for 1993. Chevron, which appeared in the Top 50 for 1992, did not have sufficient sales to be included this year.

Consolidations and mergers announced or taking place late in 1993 will continue to shape the rankings. Nobel Industries of Sweden, because of its merger with Akzo of the Netherlands in late 1993, did not report year-end 1993 financial results and was removed from the ranking. Because the merger did not take place until November, C&EN's ranking shows only Akzo's results for 1993. Had the pro forma data provided by the new company been used, Akzo Nobel, as it is now called, would have ranked seventh among chemical producers worldwide.

For the most part, the major international chemical companies went on diets during 1993, selling off pieces here and there to managerial teams and other, usually smaller, companies. As UBS's Nisbet notes, "There has been a whole string of disposals through the industry, with few new consolidations." Slimmer giants mean, for C&EN's rankings based on 1993 sales, a smaller sales total.

Even the minimum level to be included in C&EN's global Top 50 was pared down slightly—Allied-Signal made it as 50th with chemical sales of $2.79 billion in 1993, compared with $2.81 billion for 50th-ranked Air Products & Chemicals in 1992. Barely missing inclusion in the 1993 ranking were such major companies as Saudi Basic Industries Corp. (SABIC) of Saudi Arabia; Chevron, Ashland, Praxair, and Phillips Petroleum of the U.S.; and Italy's Montedison, with its Montecatini chemical operations.

However, rising prices for their products will undoubtedly affect next year's listing of chemical producers. For example, SABIC credits a "gradual recovery of the global market" for improving its sales, currently extrapolated to exceed $3 billion for 1994.

The slimmer chemical sales also point to another facet of the international chemical industry: an increasing diversification away from basic or commodity chemicals. C&EN uses the same criteria in its global ranking as in its ranking of the 100 largest U.S. chemical producers (C&EN, May 9, page 13). Wherever possible, it excludes businesses such as pharmaceuticals, consumer products, and nonchemical operations such as equipment, metals, and energy.

For companies such as major oil producers Exxon, Shell, and Elf Aquitaine, breaking out chemical businesses for scrutiny is relatively straightforward. The same holds true for other nonchemical companies such as Unilever. At many other companies, however, reorganizations and restructurings are blurring the lines between classically "chemical" operations and, for example, biosciences—a category that might include anything from pharmaceuticals to diagnostics and chiral fine chemicals. □

Hoechst moves to top of global Top 50 chemical producers

Rank 1993	Rank 1992		Total sales ($ millions)	Chemical sales ($ millions)	Chemical sales as % of total sales	Chemical operating profits ($ millions)	Chemical operating profits as % of chemical sales
1	2	Hoechst (Germany)	$27,907	$16,682	60%	$155	0.9%
2	1	BASF (Germany)	26,135	16,082	62	417	2.6
3	5	DuPont (U.S.)	37,098	15,603	42	750	4.8
4	4	Bayer (Germany)	24,853	15,012	60	207	1.4
5	3	ICI (U.K.)	15,964	13,162	82	456	3.5
6	6	Dow Chemical (U.S.)	18,060	12,524	69	773	6.2
7	7	Exxon (U.S.)	111,211	10,024	9	411	4.1
8	8	Shell (U.K., Netherlands)	95,120	9,883	10	(614)[a]	nm
9	10	Ciba (Switzerland)	15,302	9,072	59	974	10.7
10	12	Elf Aquitaine (France)	37,045	8,675	23	(141)[a]	nm
11	13	Asahi Chemical (Japan)[b,c]	8,557	8,557	100	102	1.2
12	9	Rhône-Poulenc (France)	14,234	8,276	58	39	0.5
13	14	Akzo Nobel (Netherlands)	8,876	7,032	79	284	4.0
14	11	ENI (Italy)	34,244	6,762	20	244	3.6
15	17	Mitsubishi Kasei (Japan)[b,c]	6,363	6,363	100	29	0.5
16	20	Sekusui Chemical (Japan)[b,c]	6,280	6,280	100	102	1.6
17	16	Veba (Germany)	40,182	6,103	15	(127)[a]	nm
18	19	Monsanto (U.S.)	7,902	5,651	72	731	12.9
19	30	Takeda Chemical (Japan)[b,c]	5,131	5,131	100	339	6.6
20	27	General Electric (U.S.)	60,747	5,042	8	834	16.5
21	25	Sumitomo Chemical (Japan)[b,c]	4,984	4,984	100	(3)[a]	nm
22	22	Henkel (Germany)	8,404	4,924	59	235	4.8
23	29	Toray Industries (Japan)[b,c]	4,835	4,835	100	169	3.5
24	26	Union Carbide (U.S.)	4,640	4,640	100	354	7.6
25	28	Norsk Hydro (Norway)	8,794	4,463	51	96	2.2
26	15	Solvay (Belgium)	7,056	4,424	63	78	1.8
27	24	DSM (Netherlands)	4,503	4,409	98	(147)[a]	nm
28	21	British Petroleum (U.K.)	52,477	4,405	8	(102)[a]	nm
29	31	Roche (Switzerland)	9,672	4,336	45	na	nm
30	23	BOC (U.K.)[d]	4,858	4,312	89	587	13.6
31	35	Dainippon Ink & Chemicals (Japan)[b,c]	4,244	4,244	100	57	1.3
32	33	Showa Denko (Japan)[b,c]	4,227	4,227	100	(208)[a]	nm
33	18	Air Liquide (France)	5,367	4,132	77	na	nm
34	32	Occidental Petroleum (U.S.)	8,540	4,065	48	184	4.5
35	34	Eastman Chemical (U.S.)	3,903	3,903	100	476	12.2
36	37	Amoco (U.S.)	28,583	3,773	13	321	8.5
37	36	Mobil (U.S.)	64,235	3,533	6	25	0.7
38	40	Unilever (U.K., Netherlands)	41,836	3,514	8	353	10.0
39	42	Sandoz (Switzerland)	10,203	3,411	33	344	10.1
40	43	Mitsui Toatsu Chemicals (Japan)[b,c]	3,288	3,288	100	3	0.1
41	45	Rohm and Haas (U.S.)	3,269	3,269	100	267	8.2
42	38	Total (France)	23,936	3,251	14	254	7.8
43	44	Arco Chemical (U.S.)	3,192	3,192	100	425	13.3
44	41	Courtaulds (U.K.)[b]	2,996	2,995	100	264	8.8
45	48	Mitsubishi Petrochemical (Japan)[b,c]	2,984	2,984	100	(43)[a]	nm
46	50	Air Products (U.S.)	3,328	2,906	87	417	14.3
47	39	W. R. Grace (U.S.)	4,408	2,895	66	392	13.5
48	47	Degussa (Germany)[d]	9,031	2,850	32	na	nm
49	—	Teijin (Japan)[b,c]	2,840	2,840	100	69	2.4
50	—	AlliedSignal (U.S.)	11,826	2,791	24	309	11.1

Note: Ranking based on chemical sales only. Excluded where possible are formulated products such as pharmaceuticals and cosmetics and specialty equipment, energy, and other nonchemical operations. **a**: Operating loss. **b**: Fiscal year ends March 31. **c**: Net profits and net profit margin. **d**: Fiscal year ends Sept. 30. **nm** = not meaningful; **na** = not available.